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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/188,190	11/10/98	KANEKO	K 1472-177P

002292 QM02/0321
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EXAMINER	
NGUYEN, T	
ART UNIT	**PAPER NUMBER**
3748	12

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/188,190	Kaneko et al.
Examiner	**Group Art Unit**
Tu M. Nguyen	3748

☒ Responsive to communication(s) filed on *Feb 26, 2001* .

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1-14* is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-14* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☒ The proposed drawing correction, filed on *Aug 25, 2000* is ☒ approved ☐ disapproved.

☒ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☒ received.

☐ received in Application No. (Series Code/Serial Number) _____ .

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____ .

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

1. This Office Action is in response to the Amendment filed on February 26, 2001.

Claims 2, 4, 8, 12, and 14 have been amended. Claims 1-14 are pending.

Specification

2. The disclosure is objected to because each of the chemical reaction equations on page 20 (line 21) and page 21 (line 15) should have an equal sign. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 5, 8, and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sanbayashi et al. (U.S. Patent 5,349,816) in view of Hu et al. (U.S. Patent 6,044,644).

Re claim 1, Sanbayashi et al. disclose an exhaust gas purifying apparatus of an internal combustion engine, comprising:

- exhaust gas purifying means (10), provided in an exhaust passage of the internal combustion engine, for adsorbing NO_x in exhaust gas when an air-fuel ratio of the exhaust gas is lean, and releasing or reducing the adsorbed NO_x when an oxygen concentration of the exhaust gas is reduced;

- a light-off catalyst (9) provided upstream of the exhaust gas purifying means in the exhaust passage; and

- control means (3) for controlling the air/fuel ratio of the exhaust gas so that an atmosphere having a reduced oxygen concentration is produced around the exhaust gas purifying means when an NO_x conversion efficiency of the exhaust gas purifying means is decreased.

The exhaust gas purifying apparatus of Sanbayashi et al., however, fails to specifically disclose that the light-off catalyst (9) has a lower O_2 storage ability than the exhaust gas purifying means (10).

In their invention, Sanbayashi et al. disclose that the light-off catalyst (9) is much smaller than the exhaust gas purifying means (10) (lines 21-23 of column 5) and is placed closer to the engine (see Figure 1). It is well known to those with ordinary skill in the art that the light-off catalyst (9) has a lower mass and thus lower O_2 storage ability than the down stream purifying means (10) so that the light-off catalyst can reach its operating temperature more quickly and purify harmful emissions in the exhaust gas during a short period after start-up. This well known matter is further reinforced by Hu et al. who teach a close coupled catalyst for an exhaust gas treatment system. As shown in Figures 1 and 2, the system of Hu et al. comprises a light-off

catalyst (20) that has little oxygen storage ability (lines 50-65 of column 7) and a main catalyst (24) that obviously has higher oxygen storage ability than that of the light-off catalyst (20) (lines 55-58 of column 10). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized a lower O_2 storage ability light-off catalyst upstream of a main catalyst as taught by Sanbayashi et al., since the use thereof would have provided a more effective purification apparatus to remove harmful emissions from exhaust gas.

Re claim 2, the exhaust gas purifying means in the exhaust gas purifying apparatus of Sanbayashi et al. includes

- an NO_x catalyst (22) that adsorbs NO_x in the exhaust gas when the air/fuel ratio of the exhaust gas is lean, and releases or reduces the adsorbed NO_x when the oxygen concentration of the exhaust gas is reduced, the NO_x catalyst is located in the same passage and in series with the light-off catalyst, and

- a three-way catalyst (23) provided downstream of the NO_x catalyst in the exhaust passage, for reducing harmful components in the exhaust gas when the air-fuel ratio of the exhaust gas is in the neighborhood of a stoichiometric ratio.

Re claim 5, as discussed in detail above, the three-way catalyst (23) in the apparatus of Sanbayashi et al. has an oxygen storage greater than that of the light-off catalyst (9).

Re claim 8, in the exhaust gas purifying apparatus of Sanbayashi et al., the internal combustion engine is obviously a spark ignition type four-cycle engine that operates on the four-

stroke cycle consisting of a suction stroke, compression stroke, combustion/expansion stroke, and exhaust stroke.

Re claims 10 and 11, the single catalyst (23) of the exhaust gas purifying means (10) in the exhaust gas purifying apparatus of Sanbayashi et al. functions as a three-way catalyst.

Re claim 12, the light-off catalyst (9) in the exhaust gas purifying apparatus of Sanbayashi et al. includes a single catalyst that functions as a three-way catalyst (lines 21-23 of column 5).

Re claim 13, the exhaust gas purifying means (10) in the exhaust gas purifying apparatus of Sanbayashi et al. functions also as an NOx catalyst (22).

Re claim 14, being exposed to high temperature exhaust gas, the light-off catalyst (9) in the exhaust gas purifying apparatus of Sanbayashi et al. also obviously functions as a SO_x catalyst.

5. Claims 3, 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sanbayashi et al. and Hu et al. as applied to claim 1 above, and further in view of design choice.

The exhaust gas purifying apparatus of Sanbayashi et al. discloses the invention as cited above, however, fails to disclose that an amount of oxygen adsorbed on the light-off catalyst is not greater than about 150 cc per one-liter volume of the catalyst when measured by an oxygen pulse method and that an oxygen component stored in the light-off catalyst is not greater than about 25 gr per one-liter volume of the catalyst.

One having ordinary skill in the art of exhaust emission control would have recognized that selection of the maximum volumetric or weighted amount of oxygen adsorbed in a light-off catalyst would be a function of many variables such as engine size, engine operating conditions

(load, speed, etc), air and fuel properties, capacity and size of a main catalyst, etc. Moreover, there is nothing in the record which establishes that the claimed maximum volumetric or weighted amount of oxygen adsorbed in a light-off catalyst presents a novel of unexpected result (See *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)).

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sanbayashi et al. and Hu et al. as applied to claim 8 above, and further in view of official notice.

With regard to applicants claim direct to a gasoline direct injection engine, the use of such injection is so notoriously well known in the art so as to be proper for official notice.

Response to Applicants Arguments

7. Applicant's arguments filed on February 26, 2001 have been fully considered but they are not persuasive.

In response to applicant's argument that neither Sanbayashi et al. or Hu et al. show a light-off catalyst having a lower O_2 storage ability than the exhaust gas purifying means (located downstream of the light-off catalyst) (page 5 of Applicants' Amendment B), the examiner respectfully disagrees. As shown in Figures 1 and 2, the system of Hu et al. comprises a light-off catalyst (20) that has little oxygen storage ability (lines 50-65 of column 7) and a main catalyst (24) that obviously has higher oxygen storage ability than that of the light-off catalyst (20) (lines 55-58 of column 10).

In response to applicant's argument that the element 3 in Sanbayashi et al., alleged as a temperature sensor, does not control the air-fuel ratio of the exhaust gas so that a reduced oxygen concentration is produced around the exhaust gas purifying means when an NO_x conversion efficiency of the exhaust gas purifying means is decreased (pages 5, 6, and 8 of Applicants' Amendment B), the examiner again respectfully disagrees. As clearly indicated on lines 27-31 of column 4, element 3 of Sanbayashi et al. is an engine control unit (ECU) which controls the air-fuel ratio of the exhaust gas. When the NO_x conversion efficiency of the exhaust gas purifying means (22) is decreased, the ECU switches the engine operation from fuel lean to fuel rich or stoichiometry to increase the ratio of HC-CO. In this way, the NO_x conversion efficiency of the exhaust gas purifying means can be increased (see Figures 4 and 10; lines 47-58 of column 5).

In response to applicant's argument that Sanbayashi et al. fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the light-off catalyst and the lean NO_x catalyst are in an exhaust passage and in series so that **all the exhaust gas from the engine passes through both catalysts regardless of the engine operation modes** (page 7 of Applicants' Amendment B)) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns,* 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicant's argument that the lean NO_x catalyst in Sanbayashi et al. does not have a function of absorbing and desorbing NO_x (page 7 of Applicants Amendment B), the examiner respectfully disagrees. From lines 47-49 of column 5, the lean NO_x catalyst in

Sanbayashi et al. comprises a catalytic active substance attached to a monolithic substrate. It is well known to those with ordinary skill in the art that a lean NO_x catalyst having a catalytic active substance such as platinum loaded on a refractory oxide such as alumina, oxidizes and absorbs NO_x during fuel lean operation and desorbs and reduces NO_x during fuel rich operation.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Prior Art

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of five patents.

- Aoki et al. (U.S. Patent 5,634,331) disclose an exhaust gas purification apparatus for internal combustion engines.

- Cole (U.S. Patent 5,656,244) discloses a system for reducing NO_x from mobile source exhaust gas.

- Hepburn (U.S. Patent 5,727,385) discloses a lean-burn NO_x catalyst/NO_x trap system.

- Adamczyk, Jr. et al. (U.S. Patent 5,878,567) disclose a closely coupled exhaust catalyst system and engine strategy associated with such a system.

- Jarvis et al. (U.S. Patent 6,182,443) disclose a method for converting exhaust gases from a diesel engine using nitrogen oxide absorbent.

Communication

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (703) 308-2833.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (703) 308-2623. The fax phone number for this group is (703) 308-7763.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0861.

Tu M. Nguyen

TMN

March 19, 2001

Tu M. Nguyen

Patent Examiner

Art Unit 3748

Thomas Denion

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